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JP 3-169,540

Job No.: 5000-84351

Ref: HELEN O'CONNER

Translated from Japanese by the Ralph McElroy Translation Company
910 West Avenue, Austin, Texas 78701 USA

JAPANESE PATENT OFFICE
PATENT JOURNAL (A)
KOKAI PATENT APPLICATION NO. HEI 3[1991]-169540

Int. Cl. ⁵ :	B 32 B 7/10 7/02 27/18
Sequence Nos. for Office Use:	6804-4F 6762-4F
Filing No.:	Hei 1[1989]-311435
Filing Date:	November 28, 1989
Publication Date:	July 23, 1991
No. of Claims:	2 (Total of 4 pages)
Examination Request:	Not filed

COATED FILM

Inventors:	Motosuke Matoba Kanzaki Paper Co., Ltd. Kanzaki Plant 4-3-1 Tsunemitsutera, Amagasaki-shi, Hyogo-ken
	Tosaku Okamoto Kanzaki Paper Co., Ltd. Kanzaki Plant 4-3-1 Tsunemitsutera, Amagasaki-shi, Hyogo-ken
	Tomoyuki Okimoto Kanzaki Paper Co., Ltd. Kanzaki Plant 4-3-1 Tsunemitsutera, Amagasaki-shi, Hyogo-ken

Applicant:

Kanzaki Paper Co., Ltd.
3-7 Ogawa-cho, Kanda, Chiyoda-ku,
Tokyo

Agent:

Katsu Hasumi, patent attorney

Claims

1. A coated film, characterized by the fact that the surface of a transparent film is coated with a composition consisting of at least synthetic hectorite clay, kaolin, and an emulsion type adhesive.

2. The coated film described in Claim 1, in which kaolin with an average particle diameter of 0.5-1.0 μm is blended at 5-50 wt% with respect to synthetic hectorite clay.

Detailed explanation of the invention

Industrial application field

The present invention relates to a transparent film that is excellent in electrical conductivity and blocking resistance.

Prior art

Commonly marketed, publicly known films have a high electrical resistance and they have excellent properties as insulators. On the other hand, their insulating characteristics cause static electricity owing to friction or spalling. They become the cause of a variety of problems.

For example, in the packaging field or the like, with the activation of characteristics of the film, there are problems in operating characteristics, working characteristics and so on due to dirtying and damaging by dust absorption because of the static electricity generated in the film. In some cases, they can cause fires, explosions and so on due to the static electricity.

Conventionally, as methods for rendering static electricity preventing characteristics to the film, a method for kneading an static electricity inhibitor or an electrically conductive substance inside the film, a method for the coating on the surface of the film, and so on have been developed in a variety of manners. However, a film improved in electrical conduction characteristics to a satisfactory level has not been obtained yet.

In order to improve the durability of the static electricity inhibiting effect, in general, it is common to explore a method for kneading an static electricity inhibitor or the like inside the film. In other words, it is a method in which a resin and an static electricity inhibitor are both melted and molded in the film. In this method, the static electricity inhibiting effect is exhibited by bleeding of an static electricity inhibitor from inside to the surface. Therefore, in the case of expecting a high static electricity inhibiting effect, it is necessary to use a large amount of an

static electricity inhibitor. As a result, the bleeding amount of the static electricity inhibitor is increased. There are disadvantages in that blocking occurs and, in the case of a transparent film, the transparency of the film is decreased.

On the other hand, in the method for the coating of an static electricity inhibitor on the surface of the film, it is common that the adherence of the static electricity inhibitor to the film is poor and spalling occurs readily. Its effectiveness is easily decreased.

In order to compensate this disadvantage, an static electricity inhibitor is used together with an adhesive on the surface of the film. However, there is a disadvantage in that the electrical conduction characteristics are decreased markedly.

Problems to be solved by the invention

As a result of the accumulation of zealous investigations in order to solve the numerous disadvantages of the film in the manner described previously, the present inventors have discovered that a film excellent in transparency and blocking resistance and good in electrical conduction characteristics can be obtained by selecting, in particular, synthetic hectorite clay from among a variety of static electricity inhibitors, selecting said clay, kaolin, and an emulsion type adhesive, and coating a mixed composition of these on the surface of a transparent film. The present invention has thus been accomplished.

Means to solve the problems

The present invention is a coated film characterized by the fact that the surface of a transparent film is coated with a composition consisting of at least synthetic hectorite clay, kaolin, and an emulsion type adhesive.

Effect

The synthetic hectorite clay for use in the present invention has a chemical formula shown by the following formula [I].

//insert I//

(Note; M^+ is a monovalent cation such as Na^+ , K^+ , NH_4^+ , etc. Furthermore, there may be cases in which F is not contained.)

The synthetic hectorite clay has a layered structure. The thickness of each layer of the crystal structure is about 1 nm. The structure extends in two dimensions to form a platelet. The magnesium atoms present in this platelet unit have the isomorphous substitution with lithium atoms of cations with a lower atomic valence. The platelet is negatively charged. In a dry state,

this negative charge exhibits an excellent static electricity inhibiting function by harmonizing with substitutable cations on the outside of the lattice structure of the platelet plane.

In the present invention, the amount of usage of synthetic hectorite clay is adjusted appropriately according to the type and so on of the film, without special restrictions. In general, it is adjusted to 0.1-5 g/m², more preferably 0.2-2 g/m².

Ordinarily, the transparent film treated with synthetic hectorite clay and an emulsion type adhesive as the major components is a film excellent in transparency and electrical conduction characteristics. However, it has a disadvantage in which the blocking resistance is poor. By using kaolin with an average particle diameter of 0.5-1.0 μm or so at 5-50 wt%, preferably 10-30 wt%, with respect to synthetic hectorite clay, a film excellent in transparency and blocking resistance and good in electrical conduction characteristics is obtained.

As emulsion type adhesives excellent in blocking resistance under a high temperature condition for use to render adherence to the film, a vinyl acetate type copolymer emulsion, an acryl type copolymer emulsion, a urethane type copolymer emulsion, a styrene type copolymer emulsion and so on can be used. As the amount of addition, 5-30 wt%, preferably 10-20 wt%, as a solid fraction with respect to the sum of the synthetic hectorite clay and kaolin is used.

Furthermore, with an objective to improve the coating characteristics on the film, a surfactant, a dispersant and so on can also be added.

As the surfactants, for example, polyoxyethylene distearate, glycidyl methacrylate, polyethylene glycol monomethanol, or other nonionic surfactants can be used. Furthermore, as the dispersants, for example, polyphosphoric acid sodium salt, polyacrylic acid sodium salt and so on can be used.

As the transparent films to be coated in the present invention, a polyethylene film, polypropylene film, polyester type film, polyamide type film and so on can be used. If necessary, a corona-discharge treatment, electron beam irradiation, anchor coating or other treatments on the film surface can be carried out appropriately in order to increase the coating efficiency. Furthermore, there are no special restrictions on the coating methods. For example, methods of gravure coating, blade coating, air-knife coating, bar coating and so on can be adopted appropriately.

Application examples

The present invention will be specifically explained by giving application examples in the following. However, they are not to be restricted to these. Unless specifically mentioned otherwise, "parts" and "%" in the examples represent "parts by weight" and "wt%," respectively.

Application Example 1

Synthetic hectorite clay (commercial product name: Laponite B, manufactured by Laporte Industries Ltd.)	100 parts
Polyphosphoric acid sodium salt	5 parts
Water	900 parts
Acryl type copolymer emulsion (commercial product name: Alon [transliteration] A 104, manufactured by Toa Gosei Co., Ltd.; solid concentration 40%)	40 parts
Kaolin (commercial product name: UW-90, manufactured by EMC Co.; average particle diameter 0.8 μm)	15 parts

A coating solution obtained by mixing and stirring of this composition was coated on a 100- μm -thick polyester film (commercial product name: Merinex [transliteration] 505, manufactured by ICI Co.) so that the amount of coating after drying was 1 g/m^2 and dried to achieve the coating.

Application Example 2

Synthetic hectorite clay (commercial product name: Laponite RD, manufactured by Laporte Industries Ltd.)	100 parts
Polyphosphoric acid sodium salt	5 parts
Water	900 parts
Urethane type copolymer emulsion (commercial product name: Hydran [transliteration] AP-40, manufactured by Dainippon Ink Co., Ltd.; solid concentration 23 %)	80 parts
Kaolin (commercial product name: UW-90)	15 parts
Diocetyl sulfosuccinic acid sodium salt	1 part

A coating solution obtained by mixing and stirring of this composition was coated on a 60- μm -thick polypropylene film (commercial product name: Pyren [transliteration] film, manufactured by Toyo Boseki Co., remarks: an anchor-coated product) so that the amount of coating after drying was 1 g/m^2 and dried to achieve the coating.

Comparative Example 1

Coating on a polyester film was carried out in the same manner as in Application Example 1 except that kaolin was excluded from Application Example 1.

Comparative Example 2

Coating on a polyester film was carried out in the same manner as in Application Example 1 except that, instead of kaolin in Application Example 1, 25 parts (15 parts solid) lightweight calcium carbonate with an average particle diameter of 0.5 μm (commercial product name: Pririant [transliteration] S-15, manufactured by Shiraishi Ind. Co., Ltd.; solid concentration 60%) were used.

Comparative Example 3

Anionic type electrically conductive agent (commercial product name: Chemistat [transliteration] 6120, manufactured by Sanyo Kasei Co., Ltd.; solid concentration 30%)	330 parts
Acryl type copolymer emulsion (commercial product name: Alon A 104)	40 parts
Water	670 parts
Polyphosphoric acid sodium salt	5 parts
Kaolin (commercial product name: UW-90, manufactured by EMC Co.)	15 parts

A coating solution obtained by mixing and stirring of this composition was coated on a polyester film in the same manner as in Application Example 1 to achieve the coating.

Comparative Example 4

Coating on a polyester film was carried out in the same manner as in Application Example 1 except that, instead of the acryl type copolymer emulsion (commercial product name: Alon A 104) in Application Example 1, 40 parts of a water-soluble acrylamide type adhesive (commercial product name: HSB 2450, manufactured by Sanyo Kasei Co., Ltd.; solid concentration 40%) were used.

For a total of six types of the coated films of the application examples and comparative examples obtained by the methods described previously, the following evaluation tests were carried out. The results obtained are shown in Table 1.

Evaluation tests

Measurement of surface resistance

The surface resistance of a coated film was measured under the conditions of 20°C-60% RH using a TeraOhm meter (Model VE-30, manufactured by Kawaguchi Electric Co.).

Transparency; expressed as haze %

The haze (cloudiness; %) of a coated film was measured with a hazemeter (Model TC-H III, manufactured by Tokyo Denshoku Co., Ltd.). A higher value has a higher opacity.

Blocking resistance

Five sheets of the same film were piled and allowed to stand under a pressure of 200 g/cm² for 5 h. Afterwards, the blocking state of the film was confirmed with bare hands.

Table 1

Key:	1	Surface resistance
	2	Haze (%)
	3	Blocking resistance
	4	Application Example
	5	Comparative Example

The evaluation criteria for the blocking resistance are as following.

O; No blocking at all.

Δ; Blocking tendency observed.

X; Blocking occurred.

Effect

As shown from the results in Table 1, the coated film of the present invention was excellent in transparency, blocking resistance, and electrical conduction characteristics.